Instruction Manual

Alpha pH 2000

pH/ORP Controller Transmitter

pH / mV / ºC meter

ISO 9001 CERTIFIED CE

68X216830 | Rev 3 | Apr 2008

EUTECH INSTRUMENTS
Technology Made Easy ...

Part of Thermo Fisher Scientific

Thermo SCIENTIFIC

Preface

This manual serves to explain the use of the Alpha pH 2000 series pH/ORP controller/transmitter. The manual functions in two ways, firstly as a step by step guide to help the user operate the instrument. Secondly, it serves as a handy reference guide. This instruction manual is written to cover as many anticipated applications of the Alpha pH 2000 pH/ORP controller/transmitter. If you have doubts in the use of the instrument, please do not hesitate to contact your nearest Alpha Authorised Distributor.

The information presented in this manual is subject to change without notice as improvements are made, and does not represent a commitment on part of Thermo Scientific.

Thermo Scientific cannot accept any responsibility for damage or malfunction of the unit due to improper use of the instrument.

Copyright ©2003 All rights reserved.

Safety Information

The Alpha pH 2000 Controller/ Transmitter shall be installed and operated only in the manner specified in the Instruction manual. Only skilled, trained or authorized person should carry out installation, setup and operation of the instrument.

Before powering up the unit, make sure that power source it is connected to, is as specified in the top label. Failure to do so may result in a permanent damage to the unit.

The unit has live and exposed parts inside. If it has to be opened, make sure that the power to the unit is off and disconnected.

The unit is Fuse protected. In the event the fuse has to be replaced, use only those as specified in the manual.

The degree of protection against electric shock will be achieved only by observance of the corresponding installation rules.

TABLE OF CONTENTS

1 INTRODUCTION 1

1.1 AT THE VERY BEGINNING 1
1.2 INTENDED USE 1
1.3 SAFETY INSTRUCTIONS 2
1.4 PUTTING OUT OF SERVICE / CORRECT DISPOSAL OF THE UNIT 2

2 PRODUCT DESCRIPTION 3

2.1 DESCRIPTION OF UNIT 3
2.2 MEASUREMENT AND CONTROL SYSTEM 4
2.3 UNIT OVERVIEW 5
2.3.1 Display overview 6
2.3.2 Key functions 6
2.3.3 LED indicators 7
2.3.4 Security codes 7
2.3.5 Menu overview 8

3 ASSEMBLY AND INSTALLATION 9

3.1 MOUNTING THE UNIT 9
3.2 CONNECTION DIAGRAM 11

4 NORMAL OPERATION 14

4.1 MEASUREMENT MODE 14

5 CALIBRATION MODE 15

5.1 ENTERING CALIBRATION MODE 15
5.2 PH CALIBRATION 16
5.3 ORP–MV CALIBRATION 17
5.4 ORP -% CALIBRATION 18
5.5 VIEW ACTUAL ZERO AND SLOPE 19

6 SET-UP MODE 20

6.1 ENTER SETUP MODE 20
6.2 ELECTRODE OFFSET (OFS) SUB-FUNCTION 21
6.3 SETTING TEMPERATURE (SET °C) SUB-FUNCTION 22
6.4 CONTROL RELAY A/CONTROL RELAY B (SP1/SP2) SUB-FUNCTION 23
6.5 CONTROLLER (CNTR) SUB-FUNCTION 25
6.6 CURRENT OUTPUT 1 SUB-FUNCTION 27
6.7 CURRENT OUTPUT 2 SUB-FUNCTION 28
6.8 WASH RELAY (WASH) SUB-FUNCTION 29
6.9 CONFIGURATION (CNFG) SUB-FUNCTION 30
6.10 CALIBRATION (CAL) SUB-FUNCTION 32

7 RELAY MODES 33

7.1 VIEW RELAY SET POINTS 33
7.2 MANUAL RELAY MODE 34

8 TECHNICAL SPECIFICATIONS 35

8.1 GENERAL SPECIFICATION 35
8.2 SPECIFICATIONS FOR WALL MOUNT VERSION 36
8.3 SPECIFICATIONS FOR PANEL MOUNT VERSION 37

9 ACCESSORIES 38

9.1 REPLACEMENT UNIT 38
9.2 ASSEMBLY ACCESSORIES 38

10 GENERAL INFORMATION 39

10.1 WARRANTY 39
10.2 PACKAGING 39

10.3 RETURN OF GOODS 39
10.4 GUIDELINES FOR RETURNING UNIT FOR REPAIR 40
10.5 MAINTENANCE AND CLEANING 40

11 APPENDICES 41

11.1 APPENDIX 1 – UNIT FUSE AND JUMPER SETTINGS 41
11.2 APPENDIX 2 – PH BUFFER VALUES AT VARIOUS TEMPERATURES 43
11.3 APPENDIX 3 –SIMPLE EXPLANATION ON THE FUNCTION OF HYSTERISIS 44
11.4 APPENDIX 4 – GENERAL INSTRUCTIONS CONCERNING CONTROLLER SETTING 45
11.4.1 Control characteristic of Controllers used as limit value switch 45
11.4.2 Control characteristic of P-Controller as proportional controller 45
11.4.3 Control characteristic of PI-Controller as a proportional integral controller 45
11.4.4 Controller signal of Pulse length Controllers 46
11.4.5 Controller signal of Pulse Frequency Controllers 47
11.5 APPENDIX 5 – ABBREVIATIONS USED IN MENU DISPLAYS 48

1 INTRODUCTION

1.1 At the very beginning

We thank you for having purchased the Alpha pH 2000 pH/ORP Controller.

The construction of the pH/ORP Controller employs leading edge technology and complies with safety regulations currently in force. Notwithstanding this, improper use could lead to hazards for the user or a third-party, and/or adverse effects on the plant or other equipment. Therefore, the operating instructions must be read and understood by the persons involved before work is started with the pH/ORP Transmitter.

This instruction manual identifies safety instructions and additional information by means of the following symbols:

- This symbol draws attention to safety instructions and warnings of potential danger which, if neglected, could result in injury to persons and/or damage to property.
- This symbol identifies additional information and instructions which, if neglected, could lead to inefficient operation and possible loss of production.

The instruction manual must always be stored close at hand, in a place accessible to all people working with the pH/ORP Controller.

If you have questions, which are not or insufficiently answered in this instruction manual, please contact your Eutech Instruments supplier. They will be glad to assist you.

1.2 Intended use

The Alpha pH 2000 pH/ORP Controller is intended solely for pH or ORP and temperature measurement, as described in this instruction manual.

Any other use, or use not mentioned here, that is incompatible with the technical specifications is deemed inappropriate. The operator is solely responsible for any damage arising from such use.

Other prerequisites for appropriate use include:

- observing the instructions, notes and requirements set out in this instruction manual.
- observing all local safety regulations concerning safety at work.
- observing all information and warnings in the documentation dealing with the products used together with the transmitter (housings, sensors, etc.).
- observing the prescribed environmental and operational conditions.

1.3 Safety instructions

- The Alpha pH 2000 should be installed and operated only by personnel familiar with the transmitter and who are qualified for such work.
- A defective controller must neither be installed nor put into service.
- The Alpha pH 2000 must only be operated under the specified operating conditions (see section 8).

- The Alpha pH 2000 must not be repaired by the customer.
- The Alpha pH 2000 must only be opened to replace the unit fuse or to set the jumper for Pt100/Pt1000 temperature sensor. This work must be carried out only by personnel familiar with the transmitter and who are qualified for such work. Make sure the mains cable is separated from the power supply before opening the unit.
- No modifications to the Alpha pH 2000 are allowed. The manufacturer/supplier accepts no responsibility for damage caused by unauthorised modifications. The risk is borne entirely by the user.

1.4 Putting out of service / Correct disposal of the unit

Putting out of service

- First disconnect the unit from the mains, then undo all electrical connections.
- Remove the unit from the wall / panel.

Correct disposal of the unit

When the transmitter is finally taken out of service, observe the local environmental regulations for correct disposal or send the transmitter to your local Eutech Instruments distributor, they will take care of proper disposal.

2 PRODUCT DESCRIPTION

2.1 Description of unit

The Alpha pH 2000 is used for measuring pH or ORP and temperature values. The pH or ORP values can be measured using proportional or limit control. The controller is available in two versions, one for panel mounting and one for wall mounting in an enclosure. The controller can be used for applications such as water treatment and monitoring, galvanic-decontamination, chemical processing, food processing, clean or wastewater control and neutralization processes.

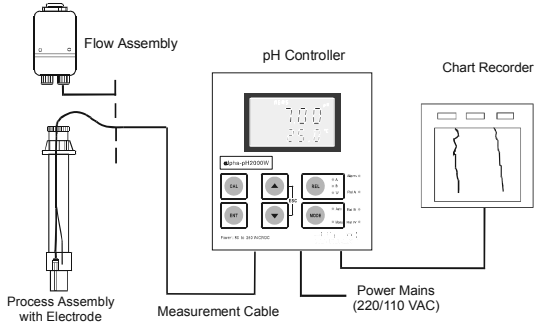
This controller has many user-friendly and safety features which include:

- Menu-driven program that simplifies set-up.
- Built-in non-volatile memory to ensure that calibration and other information are not erased if power supply fails.
- Push-button for calibration and electrode offset adjustment from the keypad.
- Automatic temperature compensation (ATC).
- Manual temperature compensation setting without the ATC probe, with independent setting for calibration and process temperature.
- Two galvanically isolated current outputs 0/4...20mA
- 0 to 1999 seconds time delay adjustment on all relays – minimizes false alarms.
- Separately adjustable high and low set-point hysteresis (dead bands) prevent chattering of relays around the set points.
- Asymmetrical/symmetrical input for pH/ORP mode of operation.
- Three control modes: limit controller, P controller and PI controller (P/PI controller as pulse length or pulse frequency).
- Large dual display LCD for easy reading with clear multiple annunciators, alarm status, operational and error messages.
- Two switching contacts as set-point relays.
- Separate alarm relay alerting you to set point limits exceeded for a certain time and if the Pt100/Pt1000 wires are broken or disconnected during the ATC function.
- Wash relay.
- Hold function to freeze output current (0/4...20mA) and release control relays.
- LED indicators signal control activities to visually monitor transmitter status from a distance.
- Protection against electromagnetic interference.
- Back lit and UV light protected LC display

2.2 Measurement and Control System

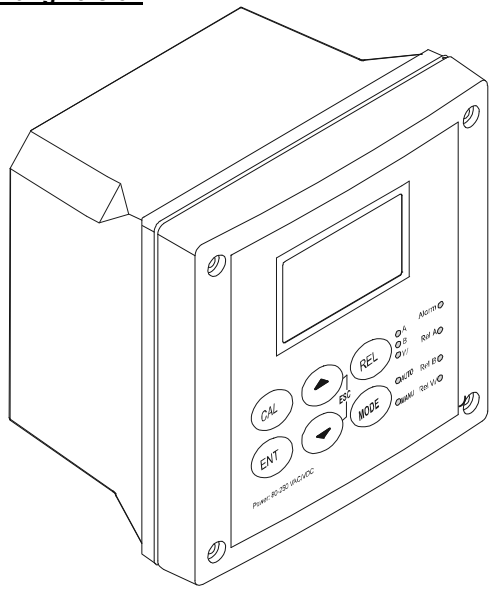
A typical measurement system consists of:

- a pH/ORP process controller
- a pH/ORP combination electrode with integrated or separate temperature sensor Pt 100/1000,
- an appropriate pH or ORP measurement cable
- an immersion, flow or process assembly with or without a potential matching pin (PMP)
- a final control element such as pump or valve
- a chart recorder

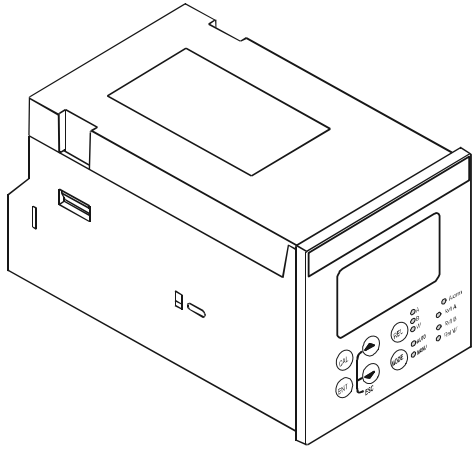


2.3 Unit Overview

Wall mounting version

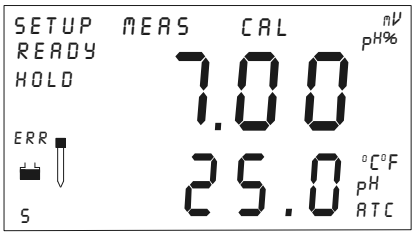


Panel mounting version



2.3.1 Display overview

The LC display shows two alpha-numerical fields for parameters and measured values as well as various mode and status indicators.



Mode indicators:

- **MEAS**: Measurement mode
- **SETUP**: Set-up mode
- **CAL**: Calibration mode

Status indicators:

- **READY**: Visible after successful calibration
- **HOLD**: Unit in “HOLD” mode
- **ATC**: Visible in ATC (Automatic Temperature Compensation) mode. Not visible in the Manual temperature compensation mode. “ATC” flashes if the temperature probe is faulty in its ATC mode
- **ERR**: Error indicator
- **S**: Visible in symmetrical measurement mode

2.3.2 Key functions

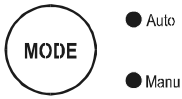
Key	Description
CAL	– Enter Calibration mode (requires access code)
ENT	– Enter Set-up mode (requires access code) – Access sub functions (parameters) within a function group of Set-up mode – Confirm (store) set-up parameters and numerical values – Start calibration in Calibration mode
▲ ▼	– Select function group in the Set-up mode. – Set parameters and numerical values(if key is pressed continuously, the setting speed increases) – Control the relays in MANUAL relay operation – Returns to “Measurement mode” when both keys are pressed simultaneously
REL	– Display limit values for SP1 and SP2 and settings for wash contact in AUTO relay operation – Toggle between RELAY A, RELAY B or Wash relay in MANUAL relay operation
MODE	– Switch from AUTO to MANUAL relay operation (requires access code)

LED indicators

Relay indicators

If REL key is pressed the LED (A, B or W) indicates to which Relay (A, B or Wash) the displayed limit values refer.

Relay mode indicators



Auto LED lights if relay operation is set to automatic mode. Manu LED lights if relay operation is set to manual mode.

Relay status indicators

Alarm ● This LED lights if limit value is exceeded or the ATC probe fails.

Rel A ● This LED lights green if measured value is within the limit for Relay A or lights red if measured value exceeds limit.

Rel B ● This LED lights green if measured value is within the limit for Relay B or lights red if measured value exceeds limit.

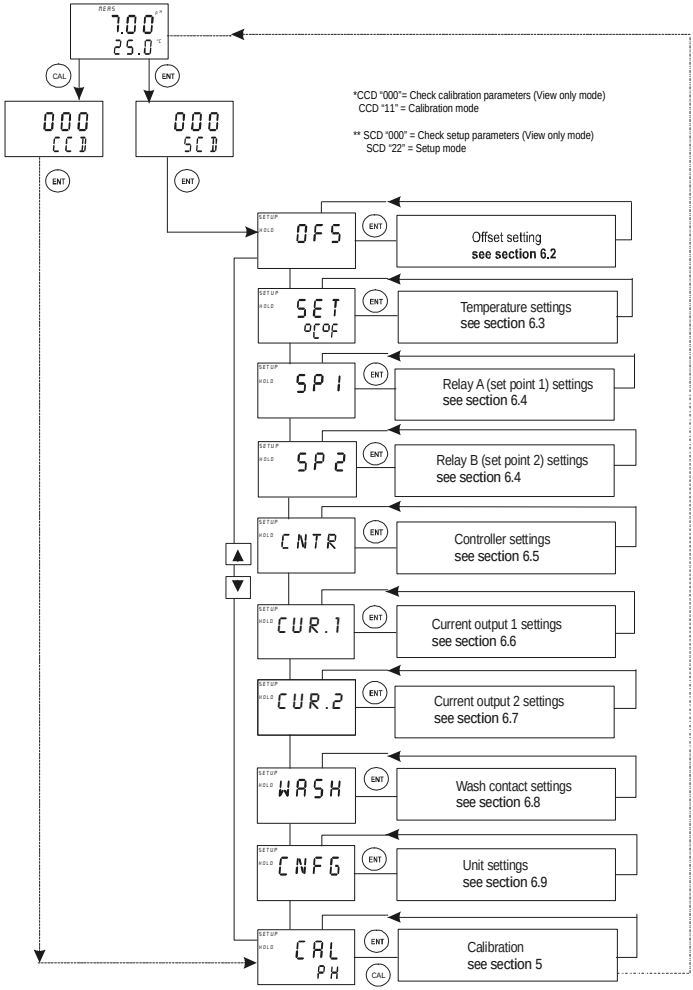
Rel W ● This LED lights if cleaning cycle is on.

2.3.3 Security codes

The access to Calibration mode, Setup mode and Manual relay operation mode is protected with security codes. The security codes are set at the factory and cannot be changed by the user. The following security codes are used:

Security code Mode	Description
000	View only mode to view actual settings
11	Calibration mode to start calibration
22	Setup mode to configure parameters
22	Manual relay operation to switch relay operation mode from automatic to manual

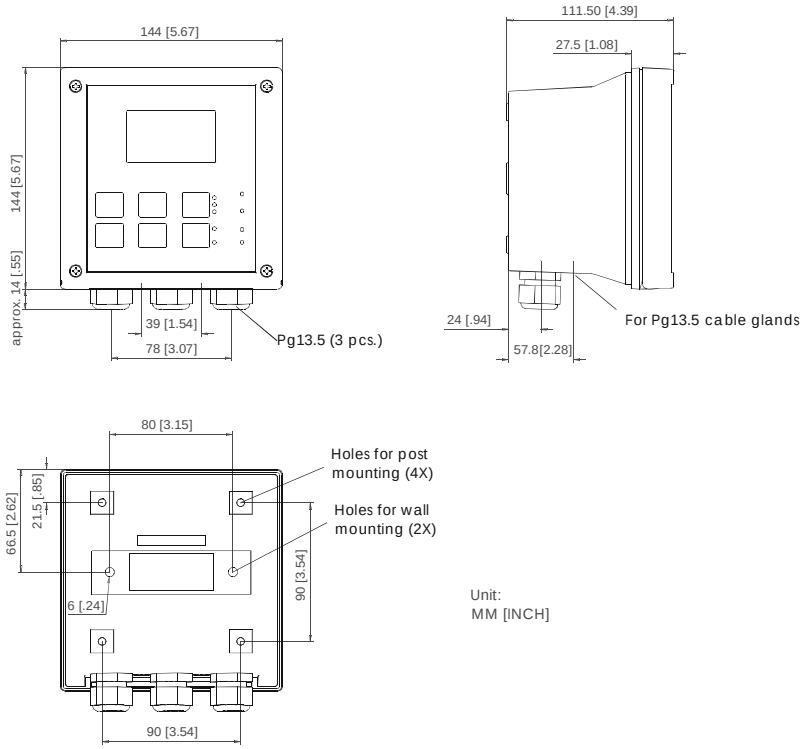
Menu overview



3 ASSEMBLY AND INSTALLATION

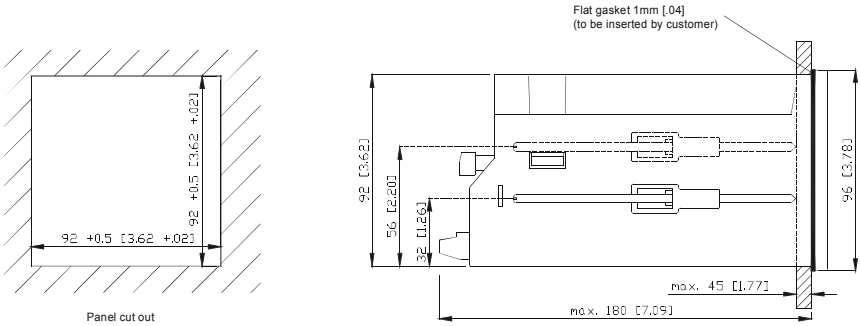
3.1 Mounting the unit

Wall Mounting Version



Transmitter housing for wall mounting: protection class IP 65

Panel mounting version



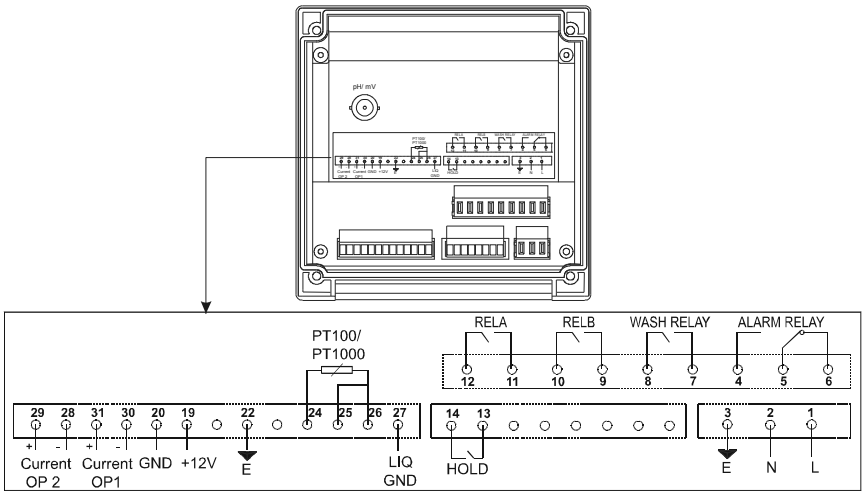
UNIT: MM [INCH]

Transmitter housing for panel mounting: protection class IP 54 (front), IP 40 (housing)

3.2 Connection Diagram

Caution: Ensure electrical mains are disconnected before proceeding.

Connection for wall mounting version



1.	AC mains live wire	17.	no connection
2.	AC mains neutral wire	18.	no connection
3.	AC mains protective earth wire	19.	12V Power supply
4.	Alarm relay (NO)	20.	12V ground
5.	Alarm relay common	21.	no connection
6.	Alarm relay (NC)	22.	Earth ground
7.	Wash relay	23.	no connection
8.	Wash relay	24.	Temperature ground
9.	Relay B (SP 2)	25.	Temperature input
10.	Relay B (SP 2)	26.	Temperature sense (short to terminal 25 if using 2- wire RTD)
11.	Relay A (SP 1)		
12.	Relay A (SP 1)	27.	PMP, liquid ground in symmetrical ode
13.	Hold function	28.	4-20 mA temperature output, -ve terminal
14.	Hold function	29.	4-20 mA temperature output, +ve terminal
15.	no connection	30.	4-20 mA pH output, -ve terminal
16.	no connection	31.	4-20 mA pH output, +ve terminal

IMPORTANT: The Alarm relay functions as an "Active Low" device i.e. it switches OFF under Alarm condition. Therefore the Alarm display device should be connected to the 'NC' contacts of the relay (5 & 6).

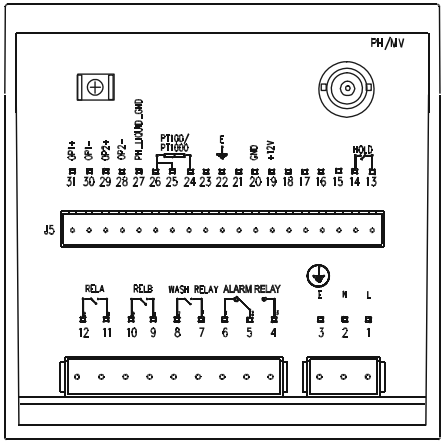
NOTE:

Switch or circuit breaker shall included in the building installation.

It shall be in close proximity to the equipment and within easy reach of the operator.

It shall be marked as the disconnecting device for the equipment.

Connection for panel mounting version



1.	AC mains live wire	17.	no connection
2.	AC mains neutral wire	18.	no connection
3.	AC mains protective earth wire	19.	12V Power supply
4.	Alarm relay (NO)	20.	12V ground
5.	Alarm relay common	21.	no connection
6.	Alarm relay (NC)	22.	Earth ground
7.	Wash relay	23.	no connection
8.	Wash relay	24.	Temperature ground
9.	Relay B (SP 2)	25.	Temperature input
10.	Relay B (SP 2)	26.	Temperature sense (short to terminal 25 if using 2- wire RTD
11.	Relay A (SP 1)		
12.	Relay A (SP 1)	27.	PMP, liquid ground in symmetrical mode
13.	Hold function	28.	4-20 mA temperature output, -ve terminal
14.	Hold function	29	4-20 mA temperature output, +ve terminal
15.	no connection	30.	4-20 mA pH output, -ve terminal
16.	no connection	31.	4-20 mA pH output, +ve terminal

IMPORTANT: The Alarm relay functions as an "Active Low" device i.e. it switches OFF under Alarm condition. Therefore the Alarm display device should be connected to the 'NC' contacts of the relay (5 & 6).

NOTE:

Switch or circuit breaker shall included in the building installation.

It shall be in close proximity to the equipment and within easy reach of the operator.

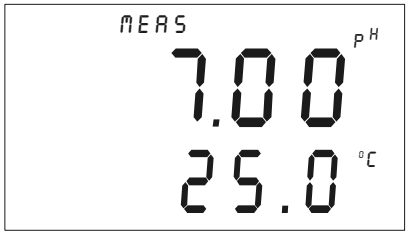
It shall be marked as the disconnecting device for the equipment.

4 NORMAL OPERATION

4.1 Measurement mode

When the controller is powered on, the display first shows all segments briefly, then the transmitter automatically enters into the **Measurement mode**.

Please note: To guarantee accurate readings the measuring system (controller and sensor) must be calibrated.



The mode indicator “MEAS” at the top of the display indicates that the controller is in Measurement mode. The upper alpha-numerical display shows the measured pH or ORP value, while the lower display shows either the temperature value if the controller is set for pH measurement, or “ORP” if it is set for ORP measurement.

The annunciators “pH”, “mV” or “%” at the upper right side of the display indicate the current measurement mode setting whether the controller is set for pH, mV or ORP % measurement.

From Measurement mode you can access **Calibration mode** and **Setup mode** by pressing the CAL key or ENT key followed by the corresponding security code. For detailed information refer to **section 5 “Calibration mode”** or **section 6 “Setup mode”**, respectively.

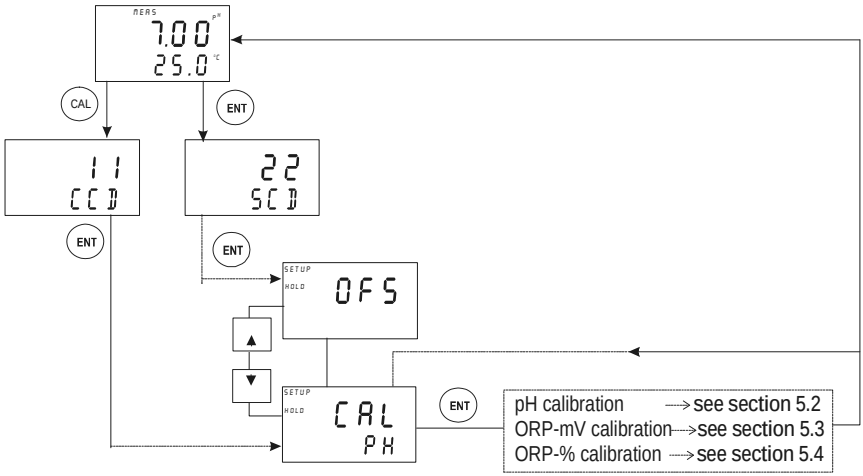
By pressing the **REL** key in Measurement mode you can view the actual relay set points. By pressing the **MODE** key in Measurement mode you can switch relay operation mode from automatic to manual.

For detailed information refer to **section 7 “Relay Modes”**.

5 CALIBRATION MODE

You can access the Calibration mode directly from the Measurement mode by pressing the CAL key and entering the Calibration security code “11”. Calibration mode may also access via the Setup mode (see section 6.1).

5.1 Entering Calibration mode



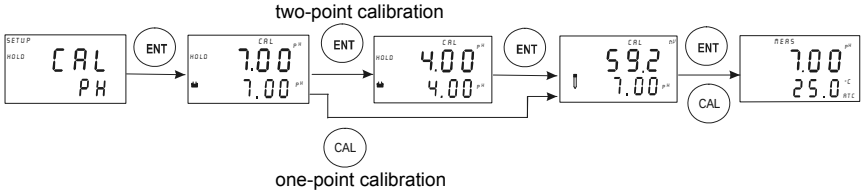
1. While in Measurement mode **press the CAL key** (direct access) or **ENT key** (access via Setup mode).
2. If **CAL key** was pressed: The display prompts you to enter the calibration security code. **Press the ▲ or ▼ key** to set the calibration security code to “**11**”, **then press the ENT key** to confirm the calibration security code.
3. If **ENT key** was pressed: The display prompts you to enter the security code. **Press the ▲ or ▼ key** to set the security code to “**22**”. **Press the ENT key** to confirm the security code, then **press the ▲ or ▼ key** to select the calibration sub-function.

If configured for pH control, the display shows “CAL PH”. If configured for ORP control, the display shows “CAL ORP”. To start calibration, refer to the corresponding section (see illustration above).

Note: to exit Calibration mode **at any time press the ▲ and▼ key simultaneously** (escape). The controller returns to the Measurement mode and the old calibration values remain active. The calibration security code automatically resets from “11” to “000” after the controller returns to Measurement mode.

5.2 pH Calibration

This controller unit features one-point or two-point calibration with five preset buffer sets. Buffer values refer to 25 °C. To calibrate the instrument, you need a standard pH buffer solution that matches one of these values.



1. **Enter Calibration mode** as described in section 5.1. The display should read “CAL PH” (for pH calibration).

Note: If the display reads “CAL OrP”, see section 6.9 for procedures on how to switch from ORP to pH readings.

2. **Press the ENT key** to start calibration. The “CAL” indicator appears at the top of display and the buffer indicator appears in the bottom corner of the display. The display shows the **actual pH reading** (upper value) and the **buffer value for zero point** (lower value). For the offset (zero point) calibration, there are two values to choose from. They are pH 7.00 or pH 6.86. **Using the ▲ and ▼ keys,** choose the value that matches with the buffer used.
3. Place the electrode in the first buffer solution. In ATC mode, you must also immerse the temperature probe in the buffer solution. Likewise for symmetrical mode, you must also immerse the potential matching pin in the buffer.
4. You can conduct either a one-point or a two-point calibration**: Press the ENT key for two point** calibration or the **CAL key for one point** calibration. The electrode indicator and CAL indicator both flash. The controller automatically adjusts the reading to match the buffer value.
5. If one-point calibration was selected, the display will show the slope and offset. If two-point calibration was selected, the lower section of the display will now show its next lower “pH” buffer. **Use ▲ and ▼ keys** to select the second buffer from one of these preset values: - pH 1.68, pH 4.01, pH 9.00, pH 9.18 and pH 10.01. Remove the electrode from the first buffer, wash and then immerse it into the second buffer. **Press the ENT key**, the electrode and CAL indicators will flash. The controller adjusts the reading to the second buffer.
6. After calibrating with the second buffer value, the controller will automatically display the slope in the upper and the zero point in the lower section of the display.

Note: You can also view the values for zero point and slope without calibration (see section 5.1.2 for instruction). The zero point and slope are re-determined after each calibration.

7. **Press the ENT key** to return to the Measurement mode.

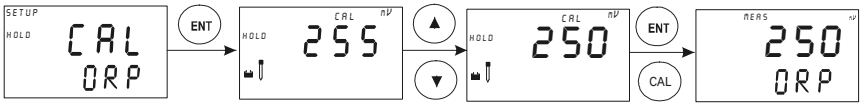
Note: If you entered the Calibration mode from the Setup mode, the controller will return to the setup menu.

Note: If there is a calibration error the transmitter displays “ERR”. In this case**, press the ▲ and ▼ keys simultaneously** (escape) to restart the calibration beginning from step 1.

Note: When calibrating with manual temperature compensation, the controller automatically changes from the preset process temperature to the calibration temperature. After leaving the Calibration mode, the controller switches back to the process temperature (for setting the calibration temperature and the process temperature, see section 6.3).

5.3 ORP–mV Calibration

If controller is configured for ORP-mV measuring you can perform only a one-point calibration.



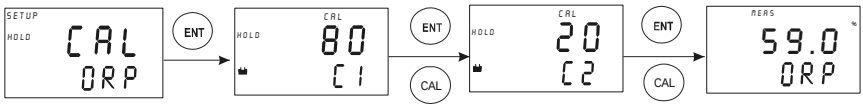
1. **Enter Calibration mode as described in section 5.1**. The display should read “CAL ORP”.

Note: If the display reads “CAL PH”, see section 6.9 for procedures on how to switch from pH to ORP-mV readings.

2. Place sensor in the ORP solution.
3. **Press the ENT key to** start calibration. The “CAL” indicator appears on the display. The display shows the current mV output of the electrode without any offset adjustment.
4. **Press the ▲ or ▼ key** to match the mV value to your exact reading.
5. **Press the ENT key** to confirm. The controller calculates the correction factor and returns to the Measurement mode.

5.4 ORP -% Calibration

If controller is configured for ORP-% measuring you can perform a calibration at two points using a low concentration sample (20%) and a high concentration sample (80%). To calibrate the controller for ORP %:



1. **Enter Calibration mode as described in section 5.1**. The display should read “CAL ORP”.

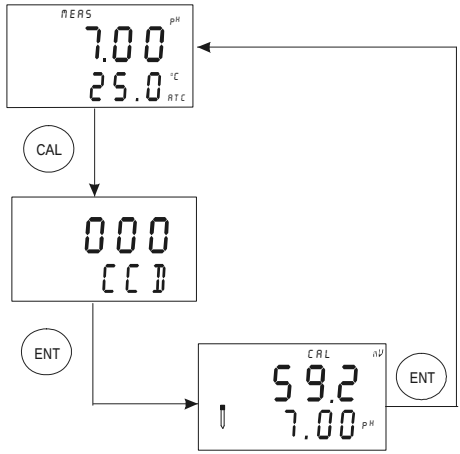
Note: If the display reads “CAL PH”, see section 6.9 for procedures on how to switch from pH to ORP-% readings.

2. **Press the ENT key** to start calibration. The display prompts you to place the sensor in the high concentration sample (relative value of 80%).
3. Place sensor in the high concentration sample, then **press the ENT key**. The electrode and CAL indicators flash. The unit automatically adjusts its reading to match the solution value.
4. The display prompts you to place the sensor in the low concentration sample (relative value of 20%). Remove the electrode from the first standard, wash it well and then immerse it in the 20% standard.
5. When the display stabilizes **press the ENT key**. The “CAL” indicator flashes and the controller adjusts its display to the 20% relative value and exits to the Measurement mode.

Note: If there is a calibration error, the transmitter displays “ERR”. In this case **press the ▲ and ▼ keys simultaneously** (escape) to restart the calibration, beginning from step 1.

Note: If you stop calibration after entering the first value, or if calibration is defective, the controller will use its original calibration data.

5.5 View actual zero and slope



1. While in Measurement mode **press the CAL key**. The display will prompt you to enter a security code. Leave the **security code** at "**000**" (view only mode).
2. **Press the ENT key**.

The display shows the slope in mV (upper value) and the pH reading at 0 mV (zero point, lower value).

Note: If no key is pressed for 30 seconds the transmitter automatically returns to the Measurement mode.

3. **Press the ENT key** to return to the Measurement mode.

6 SET-UP MODE

6.1 Enter Setup mode

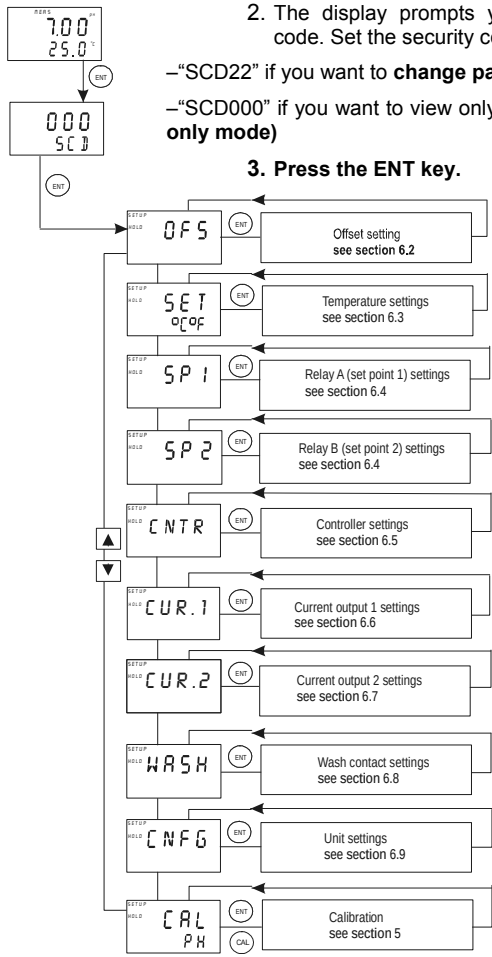
In the Setup mode the controller can be configured to your individual requirements.

1. While in Measurement mode **press the ENT key.**
2. The display prompts you to enter the security code. Set the security code with **▲ or ▼ key to:**

–"SCD22" if you want to **change parameter settings**

–"SCD000" if you want to view only parameter settings **(view only mode)**

3. Press the ENT key.



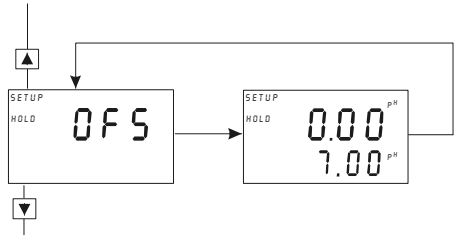
Note: to exit Setup mode at any **time press the ▲ and ▼ key simultaneously** (escape). The controller returns to the Measurement mode.

6.2 Electrode Offset (OFS) sub-function

The electrode offset sub-function is only available if the controller is configured for pH measuring. Use this sub-function to set an offset that corrects the readings without removing the electrode from the control system. The setting range is ±120 mV.

The controller will add or subtract the offset value from the measured pH and display the corrected value. However, if you need to offset the value beyond the average offset you would expect in your application type, consider a full calibration or even electrode replacement.

1. Take a sample from the system. Record the controller's pH reading at the time you take the sample.
2. Measure the pH value of your sample using a calibrated pH tester, hand-held meter, or bench meter. Record the correct pH value.
3. Select the “OFS” sub-function, then **press the ENT key**.

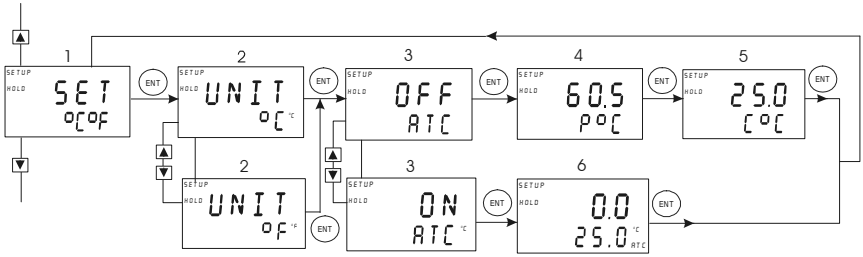


4. The display shows the current **measured pH value** (lower value) and the current **offset value** (upper value). **Press the ▲ or ▼ key** to adjust the pH value noted in Step 2. As the ▲ and ▼ keys are being pressed to adjust the pH value, the offset value also changes. **Press the ENT key** to confirm the new offset value.
5. Continue with additional Setup procedures, or return to the Measurement mode by pressing the **▲ and ▼** keys (escape) simultaneously.

Note: The offset value is reset during full calibration. See section 5 for full calibration instructions.

Note: The offset sub-function is blanked out during ORP operation.

6.3 Setting temperature (Set °C) sub-function



1. Select the “SET °C°F” sub-function, then **press the ENT key**.
2. **Selecting temperature unit: press the ▲ or ▼ key** to select the desired temperature unit “°C” or “°F”. Press the ENT key to confirm your selection.
3. **Enable/disable ATC mode: press the ▲ or ▼ key** to enable (ATC ON) or disable (ATC OFF) automatic temperature compensation. **Press the ENT key** to confirm your selection.

ATC disabled (ATC OFF):

For manual temperature compensation you can set the process and calibration temperatures. This allows calibration at a temperature other than the process temperature.

Example: setting a calibration temperature of 25°C lets you calibrate using standard buffer solutions at 25°C, even if your process temperature is different from 25°C.

4. **Setting the process temperature: press the ▲ or ▼ key** to adjust the process temperature (upper value, setting range: –9.9 to 125°C / 15 to 257 °F). **Press the ENT key** to confirm process temperature.
5. **Setting calibration temperature: press the ▲ or ▼ key** to adjust the calibration temperature (upper value, setting range: –9.9 to 125°C / 15 to 257 °F). **Press the ENT key** to confirm the calibration temperature.

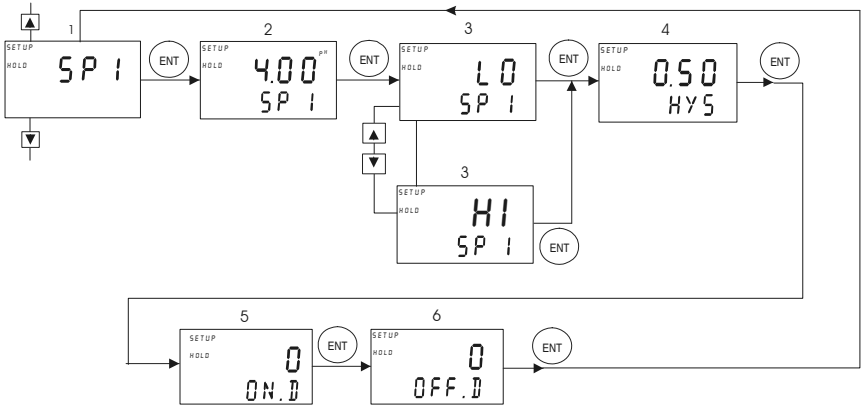
ATC enabled (ATC ON):

6. **Setting temperature offset:** The display shows the current temperature offset (upper value) and the temperature currently measured (lower value). Compare the current temperature displayed on the controller to a thermometer known to be accurate. Note down the correct temperature value. **Press the ▲ or ▼ key** to adjust the lower value. The upper number indicates the offset value. You can offset the temperature by up to ±10°C/±18°F. **Press the ENT key** to confirm your setting.

Continue with additional Setup procedures, or return to the Measurement mode by pressing the ▲ and ▼ keys (escape) simultaneously.

6.4 Control Relay A/Control Relay B (SP1/SP2) sub-function

The SP1 sub-function determines the operating parameters for Relay A; while SP2 defines the operating parameters for Relay B. Since these groups have the same set-up parameters, they are described together.



1. Select the “SP1” (Relay A) or “SP2” (Relay B) sub-function, then **press the ENT key**.
2. **Setting set point value: press ▲ or ▼ key** to enter the value for set point 1 (set point 2) at which your controller will activate. Press the ENT key to confirm your setting.
3. **Selecting relay function: press the ▲ or ▼ key** to select the desired relay function (“LO”= low or “HI”= high). **Press the ENT key** to confirm your selection.

Note: This parameter lets you choose the relay function. Select “LO” to activate the relay when the pH/ORP value undershoots the set point; select “HI” to activate the relay when the value overshoots the set point. SP1 and SP2 can be selected as “Lo/Lo”, “Lo/Hi”, “Hi/Lo”, or “Hi/Hi”.

4. **Setting a hysteresis value: press the ▲ or ▼ key** to select the desired hysteresis (setting ranges: 0.1 to 1.0 pH, 10 to 100mV or 1 to 10%) for set point 1 (set point 2). Press the ENT key to confirm your setting.

Note: Hysteresis prevents rapid contact switching if the measured value is fluctuating near the set point. **Please refer to Appendix 3** for a graphical representation of the hysteresis.

Example: You have set your high set point at pH 10.0 and your hysteresis value at pH 0.5. If your measured value overshoots pH 10.0, the controller’s relay activates. The actions of the external device will cause the solution’s pH to drop. The relay will deactivate, when the pH - value drops below 9.5 pH.

5. **Setting the on-delay time lag: press the ▲ or ▼ key** to enter the on-delay time for set point 1 (set point 2). The controller will delay activation of

the relay for the number of seconds (0 to 1999 seconds) you select. **Press the ENT key** to confirm your setting.

Note: You can set a time delay for each relay, which stops the relay from switching on the moment the set point is exceeded. This controller lets you set a 0 to 1999 second time delay before your relay activates.

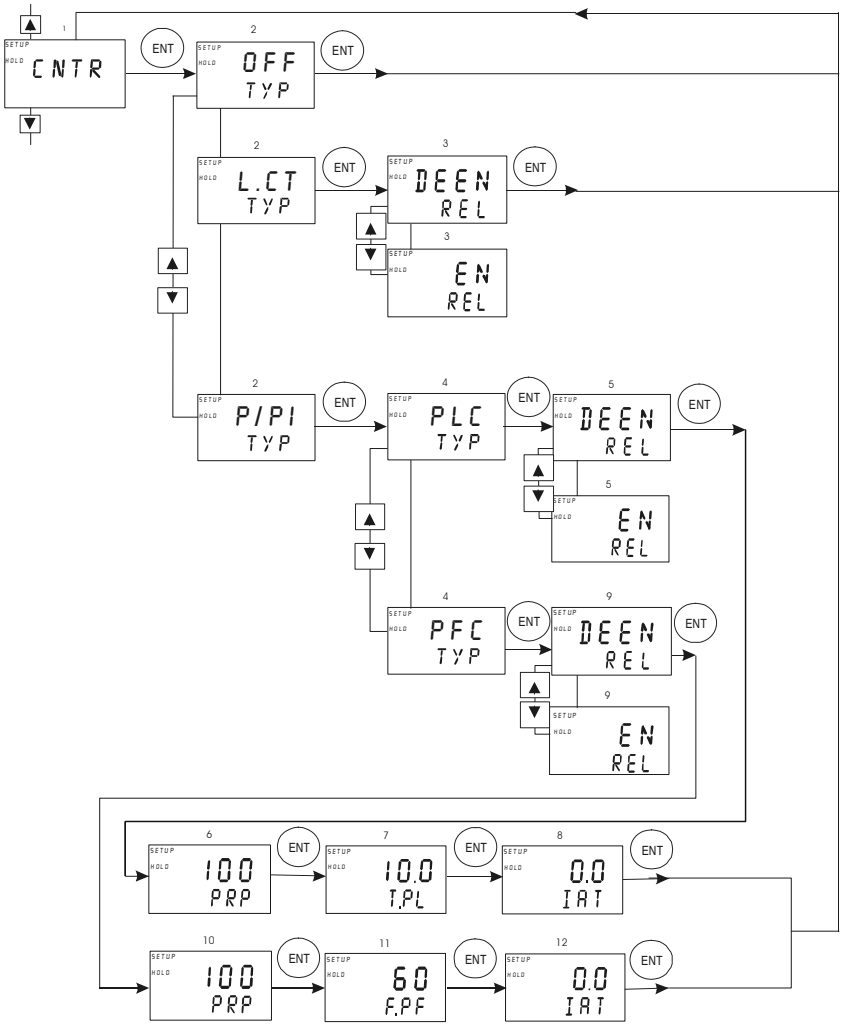
6. **Setting the off-delay time lag: press the ▲ or ▼ key** to enter the off-delay time for set point 1 (set point 2). Your controller will delay deactivation of the relay for the number of seconds (0 to 1999) you select. **Press the ENT key** to confirm your setting.

Note: You can set a time delay for each relay, which stops the relay from switching off the moment the value reaches the set point and hysteresis. This controller lets you set a 0 to 1999 second time delay before your relay deactivates.

Continue with Setup mode procedures, or return to Measurement mode by pressing the ▲ **and** ▼ keys simultaneously (escape).

6.5 Controller (CNTR) sub-function

The CNTR sub-function determines the **controller's parameters**.



1. Select the "CNTR" sub-function, then **press the ENT key**.
2. **Selecting the controller type: press the ▲ or ▼** key to select the suitable controller type:

- OFF = controller off

Use control Off to operate controller as a monitor only or to prevent relays from switching.

- L.CT = limit value control (on/off control).

Use limit control with pumps or values for fast response

- P/PI = proportional/integral control

Use proportional control to operate your pumps smoothly or for precise control of proportioning valves. Use PI controller to eliminate steady state error.

Note: please refer to Appendix 4 for detailed information on controller settings.

Press the ENT key to confirm your selection.

If the controller is set to limit value control (L.CT):

3. **Selecting the relay status under Non-Alarm condition: press the ▲ or ▼ key** to choose the desired relay status (de-energized = "DEEN" or energized = "EN"). **Press the ENT key** to confirm your selection.

- If the controller is set to proportional control (P/PI):

4. **Selecting the proportional controller type: press the ▲ or ▼ key** to select the suitable controller type ("PLC" = pulse length control, "PFC" = pulse frequency control).

Press the ENT key to confirm your selection.

If the proportional controller type is set to **pulse length control** (PLC):

5. **Selecting the relay status under Non-Alarm condition: press the ▲ or ▼ key** to choose the desired relay status (de-energized = "DEEN" or energized = "EN"). **Press the ENT key** to confirm your selection.
6. **Setting the proportional range. Press the ▲ or ▼ key** to set the proportional range (setting range: 10 to 500%). **Press the ENT key** to confirm your setting.
7. **Setting the pulse length. Press the ▲ or ▼ key** to set the pulse length (setting range: 0.5 to 20 seconds). **Press the ENT key** to confirm your setting.
8. **Setting the integral action time. Press the ▲ or ▼ key** to set the integral action time (setting range: 0.0 to 999.9 minutes). **Press the ENT key** to confirm your setting.

Note: If the integral action time is set to '0.0', then the unit functions as a 'P' Controller.

If the proportional controller type is set **to pulse frequency control** (PFC):

9. **Selecting the relay status under Non-Alarm condition: press the ▲ or ▼ key** to choose the desired relay status (de-energized = "DEEN" or energized = "EN**"). Press the ENT key** to confirm your selection.

10. **Setting the proportional range: press the ▲ or ▼ key** to set the proportional range (setting range: 10 to 500%). **Press the ENT key** to confirm your setting.

11. **Setting the pulse frequency: press the ▲ or ▼ key** to set the pulse frequency (setting range: 60 to 120 pulses per minute**). Press the ENT key** to confirm your setting.

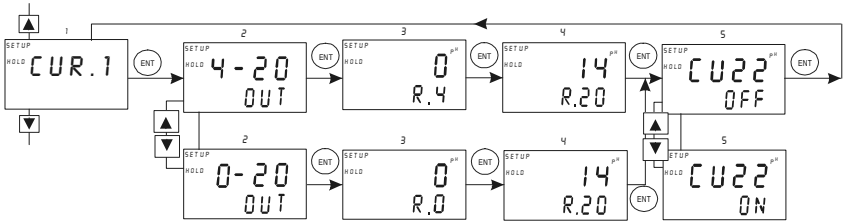
12. **Setting the integral action time: press the ▲ or ▼ key** to set the integral action time (setting range: 0.0 to 999.9 minutes). **Press the ENT key** to confirm your setting.

Note: If the integral action time is set to '0.0', then the unit functions as a 'P' Controller.

Continue with Setup mode procedures, or return to Measurement mode by pressing the ▲ **and** ▼ keys simultaneously (escape).

6.6 Current Output 1 sub-function

In this sub-function you set the current output range of the transmitter for pH or mV values.



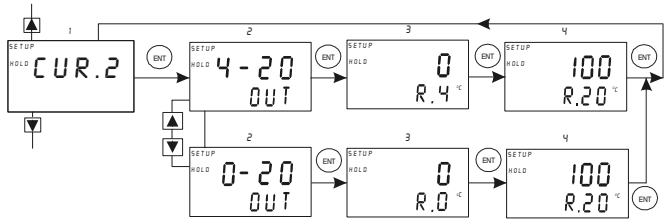
1. Select the "CUR.1" sub-function, then **press the ENT key**.
2. **Selecting the output type: press the ▲ or ▼ key** to select the desired output type: 0-20 mA or 4-20 mA. **Press the ENT key** to confirm your selection.
3. **Setting the pH or ORP value at which the transmitter output will be 4 mA (or 0 mA): press the ▲ or ▼ key** to set the pH or ORP value to be equivalent to 4 mA or 0 mA, respectively. **Press the ENT key** to confirm your setting.
4. **Setting the pH or ORP value at which the transmitter output will be 20 mA: press the ▲ or ▼ key** to set the pH or ORP value to be equivalent to 20 mA. **Press the ENT key** to confirm your setting.
5. **Selecting out of range current: Press the ▲ or ▼ key** to switch "CU22" on or off. If "CU22" is on, the output signal will jump to 22 mA when the measured pH and ORP value is below or above the values set in points 3 & 4 above. **Press the ENT key** to confirm your setting.

Note: the "CU22" setting (on/off) of current output 1 applies to current output 2 as well.

Continue with Setup mode procedures, or return to Measurement mode by pressing the ▲ **and** ▼keys simultaneously (escape).

Current Output 2 sub-function

In this sub-function you set the current output range of the transmitter for temperature values.

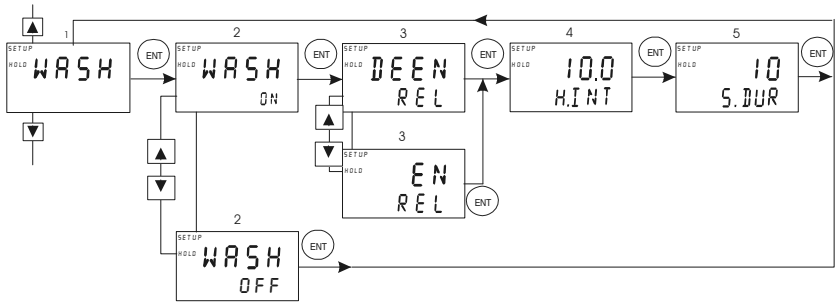


1. Select the “CUR.2” sub-function, then **press the ENT key**.
2. **Selecting the output type: press the ▲ or ▼ key** to select the desired output type: 0-20 mA or 4-20 mA. **Press the ENT key** to confirm your selection.
3. **Setting the temperature value at which the transmitter output will be 4 mA (or 0 mA): press the ▲ or ▼ key** to set the temperature value (setting range: -9.9 to 115°C or 15 to 237 °F) to be equivalent to 4 mA (or 0 mA). **Press the ENT key** to confirm your setting.
4. **Setting the temperature value at which the transmitter output will be 20 mA: press the ▲ or ▼ key** to set the temperature value (setting range: -0.1 to 125°C or 35 to 257 °F) to be equivalent to 20 mA. **Press the ENT key** to confirm your setting.

Continue with Setup mode procedures, or return to Measurement mode by pressing the **▲ and ▼** keys simultaneously (escape).

6.7 Wash relay (WASH) sub-function

In this sub-function you set the parameters for the wash relay.



1. Select the "WASH" sub-function, **then press the ENT key.**

2. **Enabling/disabling wash function: press the ▲ or ▼ key** to enable (WASH ON) or disable (WASH OFF) wash function. **Press the ENT key** to confirm your selection.

3. **Selecting the relay status condition: press the ▲ or ▼ key** to choose desired relay status (de-energized = "DEEN" or energized = "EN"). **Press the ENT key** to confirm your selection.

4. **Setting the wash interval in hours: Press the ▲ or ▼ key** to set the desired wash interval (setting range: 0.1 to 199.9 hours). **Press the ENT key** to confirm your setting.

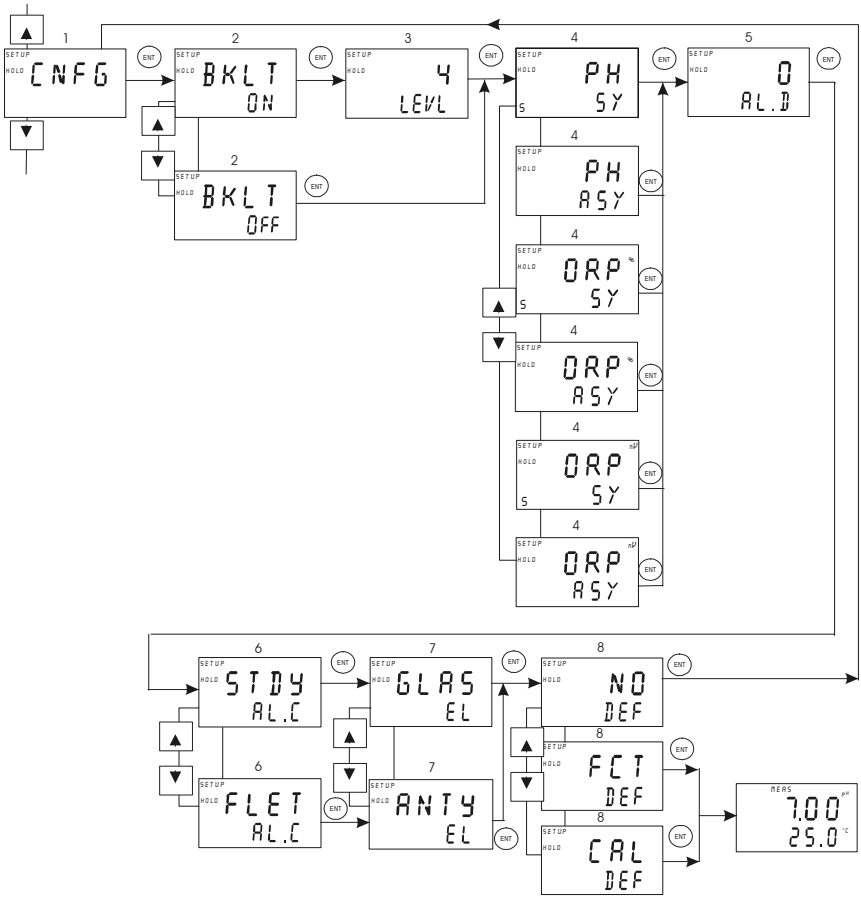
5. **Setting the wash duration in seconds: Press the ▲ or ▼ key** to set the desired wash duration (setting range: 1 to 1999 seconds). **Press the ENT key** to confirm your setting.

Note: During wash cycle the controller is set to HOLD. For safety reasons, the HOLD function is activated 5 seconds prior and deactivated 10 seconds after the wash cycle.

Continue with Setup mode procedures, or return to Measurement mode by pressing the ▲ **and** ▼ keys simultaneously (escape).

6.8 Configuration (CNFG) sub-function

In this sub-function you configure the controller to suit your requirements.



1. Select the “CNFG” sub-function, then **press the ENT key**.
2. **Enabling/disabling the display backlight: press the ▲ or ▼ key** to switch display backlight on (BKLT ON) or off (BKLT OFF). **Press the ENT key** to confirm your selection.
3. **Setting the backlight intensity** (appears only **If backlight is on**): **press the ▲ or ▼ key** to set backlight intensity (setting range: minimum 1 to maximum 4). **Press the ENT key** to confirm your setting.
4. **Selecting the measurement mode: press the ▲ or ▼ key** to select measurement mode:

– “PH SY” = pH measurement with symmetrical input

– “PH ASY” = pH measurement with asymmetrical input

– “ORP % SY” = ORP-% measurement with symmetrical input

– “ORP % ASY” = ORP-% measurement with asymmetrical input

– “ORP mV SY” = ORP-mV measurement with symmetrical input

– “ORP mV ASY” = ORP-mV measurement with asymmetrical input

Press the ENT key to confirm your selection.

5. **Setting the alarm delay time in seconds: press the ▲ or ▼ key** to set the alarm delay time (setting range: 0 to 1999 seconds**). Press the ENT key** to confirm your setting.

Note: With this parameter you set the delay before the alarm relay activates when the set point has been exceeded.

6. **Selecting the alarm contact type: press the ▲ or ▼ key** to select the alarm contact type:

– “STDY” = steady contact

– “FLET” = fleeting (single pulse) contact

Press the ENT key to confirm your selection.

Note: With this parameter you select whether the alarm contact will operate as a steady contact or a fleeting (single pulse) contact. Pulse contact closing time is 1 second.

7. **Selecting the sensor type: press the ▲ or ▼ key** to select the sensor type which is connected to the controller:

– “GLAS” = glass electrode

– “ANTY” = antimony electrode

Press the ENT key to confirm your selection.

Note: This parameter is not available in ORP mode.

Note: After each changeover, the factory calibration data for zero point and slope are overwritten. Be sure to recalibrate (see section 5).

8. Resetting the controller settings to factory defaults: The display shows “NO DEF”. **Press the ▲ or ▼ key** to select:

– “NO DEF” = keeps old values active, when confirmed with ENT.

– “FCT DEF” = resets all settings to factory defaults, when confirmed with ENT.

– “CAL DEF” = resets calibration settings to factory defaults, when confirmed with ENT.

Press the ENT key. The selected function will be executed and the controller returns automatically to the Measurement mode.

Continue with Setup mode procedures, or return to Measurement mode by pressing the **▲ and ▼** keys simultaneously (escape).

6.9 Calibration (CAL) sub-function

The calibration procedure in Setup mode is identical to the procedure in the Calibration mode (see section 5). The only difference is that the transmitter remains in Setup mode (instead of Measurement mode) after calibration is completed.

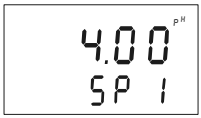
7 RELAY MODES

You can control devices connected to Relay A, Relay B or wash relay via the front panel of the transmitter. In Automatic mode, the controller's set point values activate the relays. In Manual mode, you can manually turn "on" and "off" the control devices connected to relay A or relay B.

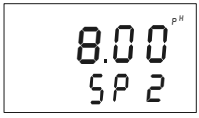
7.1 View relay set points

To view relay setpoints, the relay mode must be set to automatic (standard mode after switch-on, relay mode LED "Auto" lights).

While in Measurement mode press the REL key.



The display shows the set point value for Relay A and LED "A" lights.



After two seconds the display shows the set point value for Relay B and LED "B" lights).

After two seconds the display shows the status of the Wash relay and LED "W" lights. If Wash relay is "off" the display shows "WASH OFF". If Wash relay is "on" the wash interval time and wash duration is displayed

After an additional two seconds the controller will return to Measurement mode.

7.2 Manual relay mode

In manual relay mode, you can manually turn “on” and “off” the control devices connected to Relay A, Relay B or Wash relay.

1. While in Measurement mode **press the MODE key**.
2. The display prompts you to enter the security code. **Press the ▲ or ▼ key** to set security code to “22”.
3. **Press the ENT key**. The Manual relay mode is activated and the relay mode LED “MANU” lights.

Note: Pressing ENTER key at a value other than “22” will cause the controller to revert to Measurement mode, and the relays will remain in automatic mode.

4. **Press the REL key** to select either Relay A, Relay B or Wash relay. The corresponding LED (A, B, or W) turns to red.

The manual control options now available depend on the control type (limit, pulse frequency, or pulse length) you selected and set in section 6.5.

If you selected Limit control: The display shows the current measured value and “OFF” or “ON” depending on the relay status of the currently selected relay.

If you selected Pulse length control: The display shows the current measured value (upper value) and the on time as a percentage of the current duration set in the CNTR sub-function in setup mode (lower value).

If you selected Pulse frequency control: The display shows the current measured value (upper value) and the pulse frequency (lower value).

5. **Press the ▲ or ▼ key** to change the Relay on/off status, pulse length, pulse frequency or wash function. The relay status LED at the right of the controller will also change from Red to Green.

Note: If you wish to manually change the status of relays, press the **REL key** at this point and repeat step 5 for the other two relays. The relay(s) will remain under manual control while you are setting a relay.

6. **Press the MODE key** to return to Measurement mode. The relays are now back to automatic control.

8 TECHNICAL SPECIFICATIONS

8.1 General Specification

Alpha pH 2000 Controller / Transmitter

pH Range	-2.00 to 16.00 pH
Resolution & Accuracy	0.01 pH & ± 0.01 pH
mV Range	0 to 100% or -1000 to 1000 mV
Resolution & Accuracy	0.1% or 1 mV / ± 1 mV
Temperature	-9.9 to 125 ^{o}C (15.0 to 257.0 ^{o}F)
Resolution & Accuracy	0.1 & ± 0.5 ^{o}C (± 1.0 ^{o}F)
Sensor	Pt 1000 or Pt 100 (jumper selectable)
Temperature Compensation	Automatic (± 10 ^{o}C / ± 18 ^{o}F offset adjustment) / Manual

Set-point And Controller Functions

Function	Limit / Proportional Control / Proportional Integral (Pulse Length or Pulse Frequency)
Integral time	0 to 999.9 minutes
Adjustable period with pulse length controller	0.5 to 20 sec
Adjustable period with pulse frequency controller	60 to 120 pulses/min
Pickup / Dropout Delay	0 to 1999 seconds
Wash Cycle	0.1 to 199.9 hours
Wash Duration	1 to 1999 seconds
Switching pH Hysteresis	0.1 to 1 pH
Switching ORP Hysteresis	1 to 10.0 % / 10 to 100 mV
Contact Outputs, Controller	1 SPDT; 3 SPST relays
Switching Voltage/Current/Power	Max 250 VAC / Max 3A / Max 600 VA

Alarm Functions

Function (switchable)	Latching / pulse
Pickup delay	0 to 1999 seconds
Switching Voltage/Current/Power	Max 250 VAC / Max 3A / Max 600 VA

Display

LCD	UV coat, backlit 14 segments display with symbols for status information
Backlight	On/Off selection with four level of brightness control

EMC Specifications	
Emitted Interference	EN 61 326
Immunity to Interference	EN 61 326

Environmental Conditions	
Ambient Temp. Operating Range	-10 to 50 ^{o}C (14 to 122 ^{o}F)
Rel. Humidity	10 to 95% (non-condensing)

Power Supply

Input	80 to 250 VAC/DC 48/62 Hz
Main Fuse	250 mA anti-surge
Pollution Degree	2
Transient Overvoltage category	II

8.2 Specifications for wall mount version

Electrical Data and Connections

Signal output	Two 0/4 to 20 mA outputs for pH/mv and temperature , galvanically isolated
Load	Max.600 Ω
pH / ORP Input	BNC (10^{12} Impedance)
Connection terminal	(1 x 3-pins; 8-pin, 9-pin & 13-pin terminal blocks)

Mechanical Specification

Dimensions	144 x 144 x 111.5 mm (5.67 x 5.67 x 4.39 inch)
Weight	745g (unit); 1100g (boxed)
Material	PBT
Insulation	NEMA 4X, IP 65

8.3 Specifications for panel mount version

Electrical Data And Connections

Signal output	Two 0/4 to 20 mA outputs for pH/mv and temperature , galvanically isolated
Load	Max.600 Ω
pH / ORP Input	BNC (10^{12} Impedance)
Connection terminal	(1 x 3-pin; 1 x 9-pin & 1 x 19-pin terminal blocks)

Mechanical Specifications

Dimensions	175 x 96 x 96 mm (6.89 x 3.78 x3.78 inch)
Weight	550g (unit); 950g (boxed)
Material	ABS
Insulation	IP 54 (front) , IP 40 (housing)

9 ACCESSORIES

9.1 Replacement Unit

Product Description	Thermo Scientific Order Code
Alpha pH 2000 pH/ORP Controller/Transmitter, wall mount version	TSPHCTP2000W
Alpha pH 2000 pH/ORP Controller/Transmitter, panel mount version	TSPHCTP2000P

Product Description	Eutech Instruments Order Code
Alpha pH 2000 pH/ORP Controller/Transmitter, wall mount version	ECPHCTP2000W
Alpha pH 2000 pH/ORP Controller/Transmitter, panel mount version	ECPHCTP2000P

9.2 Assembly Accessories

Product Description	Eutech Instruments Order Code
pH Combination Electrode with Pt 100 RTD and PMP	EC100GTSO05B
pH Combination Electrode with HF resistant glass (w/o ATC & PMP)	ECARTSOHF05B
pH Combination Electrode with PMP (w/o ATC)	ECARGTSO05B
pH Combination Electrode with high temperature resistance (110 ^{o}C) and high pressure resistance (9 bar) (w/o ATC & PMP)	ECARHTTSO05B
pH Combination Electrode (w/o ATC & PMP)	ECARTSO05B
ORP Gold Electrode with PMP but w/o ATC	ECHTAUTSO05B
ORP Platinum Electrode with PMP but w/o ATC	ECHTPTTSO05B

Note: Above pH/ORP electrodes withstand up to 6 bar pressure except EC-ARHTTSO-05B. These electrodes have integral 5m measuring cable terminating with a BNC connector.

Please contact your authorised distributor or dealer for the prices of extension measuring cables and other accessories like tee joints, electrode assembly, and calibration solutions.

10 GENERAL INFORMATION

10.1 Warranty

This Controller transmitter is supplied with a one-year warranty against significant deviations in material and workmanship from date of purchase and a six-month warranty for probe. Each instrument will have a warranty card with a specific serial number. The warranty card must be endorsed by the Authorized Distributor at the point of sale.

If repair or adjustment is necessary and has not been the result of abuse or misuse within the designated period, please return – freight pre-paid – and correction will be made without charge. Thermo Scientific/ Eutech will determine if the product problem is due to deviations or customer misuse.

Out of warranty products will be repaired on a charged basis.

Exclusions

The warranty on your instrument shall not apply to defects resulting from:

- Improper or inadequate maintenance by customer
- Unauthorized modification or misuse
- Operation outside of the environment specifications of the products

10.2 Packaging

The instrument is packaged in a corrugated box with a warranty card, instruction manual and the following accessories:

Wall mount version

- Plug, nylon, black, 2 pcs
- PG 13.5, cable gland, 3 pcs
- Connectors, 1 each of 3-way (5.08 mm), 9-way(5.08 mm), 13-way (3.5 mm), 8-way (3.5 mm)

Panel mount version

- Rubber Gasket, 1 pc
- Catch, 2 pcs
- Rod, thread, 2 pcs
- Connectors, 1 each of 3-way (5.08 mm), 9-way (5.08 mm) and 19-way (3.5 mm).

10.3 Return of Goods

Authorization must be obtained from our Customer Service Department or authorized distributor before returning items for any reason. A “Return Goods Authorization” (RGA) form is available through our authorized distributor. Please include data regarding the reason the items are to be returned. For your protection, items must be carefully packed to prevent damage in shipment and insured against possible damage or loss. Thermo Scientific will not be responsible for damage resulting from careless or insufficient packing. A restocking charge will be made on all unauthorized returns.

NOTE: Thermo Scientific reserves the right to make improvements in design, construction, and appearance of products without notice.

10.4 Guidelines for Returning Unit for Repair

Use the original packaging material if possible when shipping the unit for repair. Otherwise wrap it with bubble pack and use a corrugated box for additional protection. Include a brief description of any faults suspected for the convenience of Customer Service Dept., if possible.

10.5 Maintenance and Cleaning

Maintenance

The Alpha pH 2000 contains no user repairable components. Please contact Eutech Instruments or its distributor if there is any problem with the unit.

Cleaning

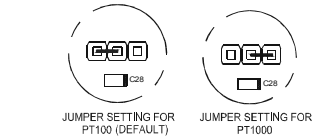
To remove dust, dirt and spots, the external surfaces of the controller may be wiped with a damp, lint-free cloth. A mild household cleaner can also be used if necessary.

11 APPENDICES

11.1 Appendix 1 – Unit fuse and jumper settings

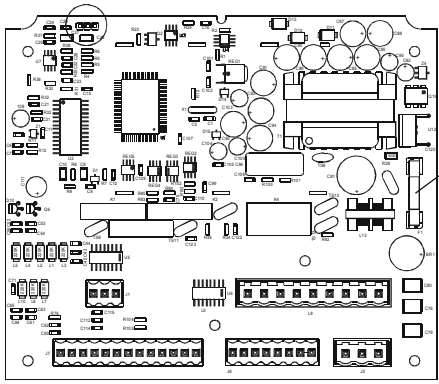
- Caution! Before opening the unit to replace the unit fuse or to set the jumper for Pt 100 / Pt 1000 temperature sensor, make sure the mains cable is separated from the power supply.

Wall mounting version

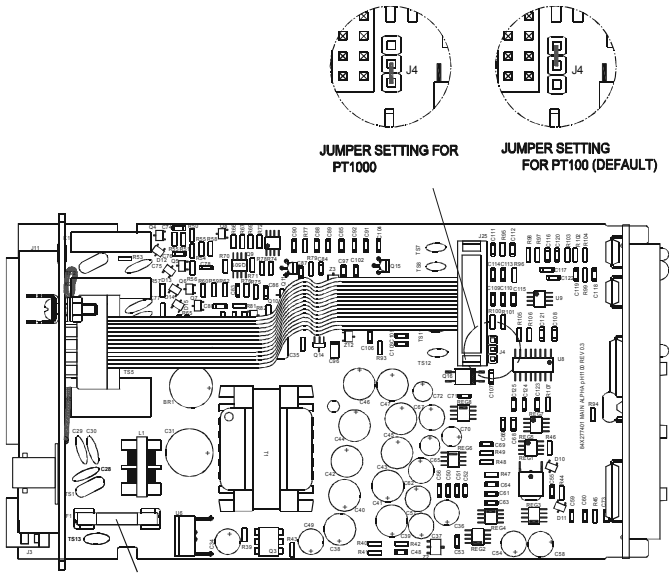


JUMPER SETTING FOR PT100 (DEFAULT)

JUMPER SETTING FOR PT1000



Panel mounting version

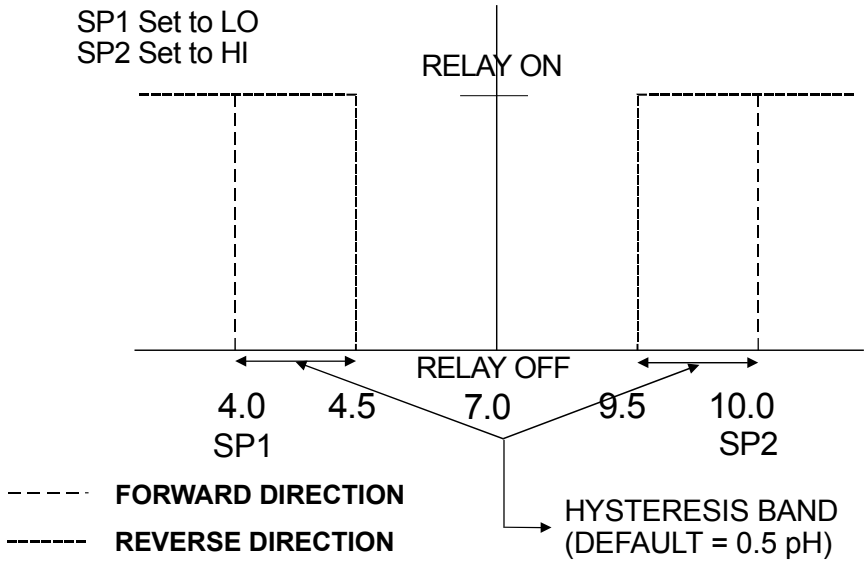


11.2 Appendix 2 – pH buffer values at various temperatures

The following table shows the various pH values at different temperature of the solution during calibration.

Temperature (^{o}C)	pH 1.00	pH 4.01	pH 6.86	pH 7.00	pH 9.00	pH 9.18	pH 10.01
0	0.96	4.01	6.98	7.12	9.33	9.47	10.32
5	0.99	4.01	6.95	7.09	9.24	9.38	10.25
10	0.99	4.00	6.92	7.06	9.16	9.32	10.18
15	0.99	4.00	6.90	7.04	9.11	9.27	10.12
20	1.00	4.00	6.88	7.02	9.05	9.22	10.06
25	1.01	4.01	6.86	7.00	9.00	9.18	10.01
30	1.01	4.01	6.85	6.99	8.95	9.14	9.97
35	1.01	4.02	6.84	6.98	8.91	9.10	9.93
40	1.01	4.03	6.84	6.97	8.88	9.07	9.89
45	1.01	4.04	6.83	6.97	8.85	9.04	9.86
50	1.01	4.06	6.83	6.97	8.82	9.01	9.83
55	1.01	4.08	6.83	6.97	8.79	8.99	9.81
60	1.02	4.10	6.84	6.98	8.76	8.96	9.79
70	1.02	4.12	6.85	6.99	8.72	8.92	9.76
80	1.02	4.16	6.86	7.00	8.68	8.89	9.74
90	1.02	4.20	6.88	7.02	8.65	8.85	9.73

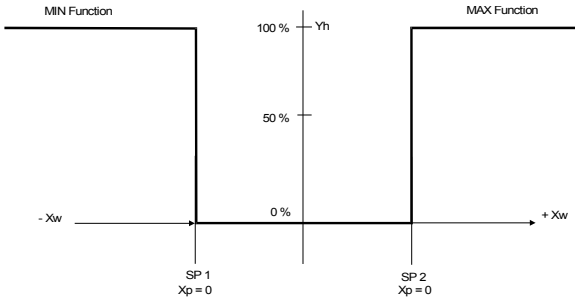
11.3 Appendix 3 –Simple explanation on the function of hysterisis



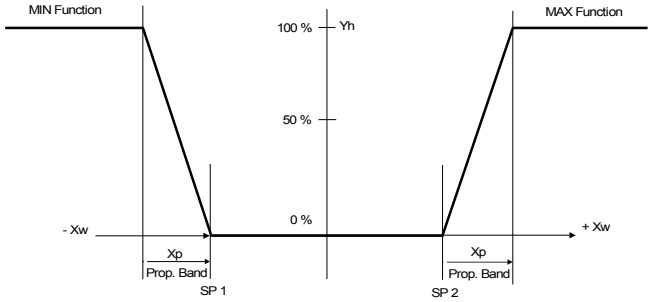
The controller relay activates when the set-point is reached. In the reverse direction, it does not de-activate when the value reaches the set-point. Instead, it continues to be active till the value reaches the amount set by the Hysteresis band.

11.4 Appendix 4 – General instructions concerning Controller Setting

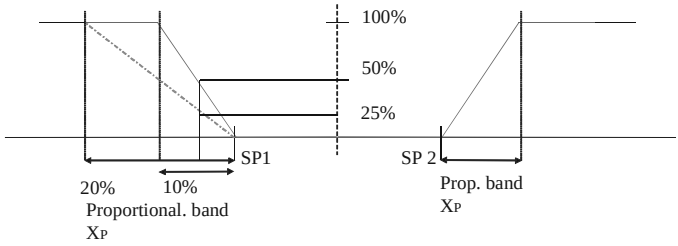
11.4.1 Control characteristic of Controllers used as limit value switch



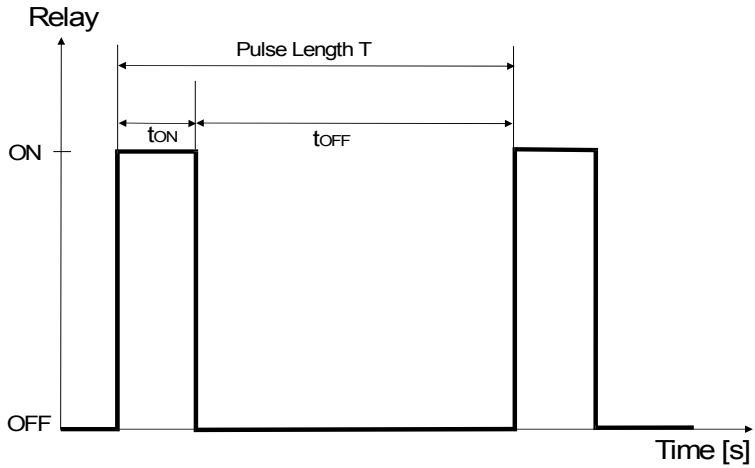
11.4.2 Control characteristic of P-Controller as proportional controller



11.4.3 Control characteristic of PI-Controller as a proportional integral controller



11.4.4 Controller signal of Pulse length Controllers



The output relay of the pulse length controller is clock-timed. The switching period T remains constant. Depending on the divergence from the limit value, the switch-on time t_{ON} is increased or decreased in accordance with the proportional range Xp.

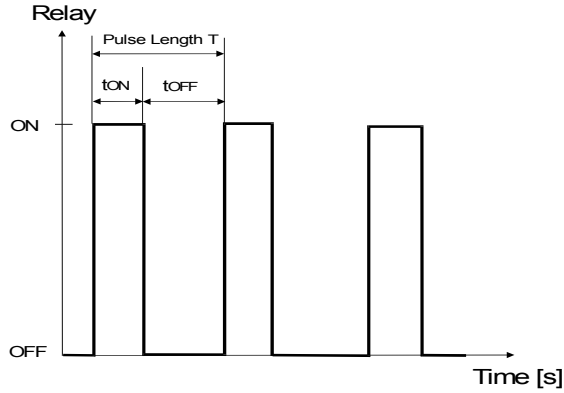
The following applies:

$t_{ON} + t_{OFF} = T$ (Const.)

greater divergence ➔ greater t_{ON}

Xp exceeded ➔ $t_{ON} = T$ (relay remains picked up)

11.4.5 Controller signal of Pulse Frequency Controllers



The output relay of the pulse frequency controller is clock-timed. The pulse duration t_{ON} remains constant at 250mS. Depending on the divergence from the limit value, the frequency **($^{1}/_{T}$)** is increased or decreased in accordance with the proportional range Xp.

The following applies:

t_{ON} = Const. (250 msec.)

greater divergence ➔ greater f (greater frequency)

Xp exceeded ➔ max. frequency

11.5 Appendix 5 – Abbreviations used in menu displays

Abbreviation	Meaning
MEAS	Measurement
CAL	Calibration
ENT	Enter
OFS	Offset
C.CD	Calibration Security Code
S.CD	Setup Security Code
SET	Setting
ATC	Automatic Temperature Compensation
SP1	Setpoint 1
SP2	Setpoint 2
LO	Low limit
HI	Hi Limit
HYS	Hysteresis
ON.D	On delay
OFF.D	Off delay
CNTR	Controller
L.Ct	Limit control
PLC	Pulse Length Control
PFC	Pulse Frequency Control
P/PI	Proportional control
EN	Energized
DEEN	Deenergized
REL	Relay
PRP	Proportional band
T.PL	Pulse length time
F.PF	Pulse frequency time
IAT	Integral action time
MANU	Manual

Abbreviation	Meaning
CUR.1	Output current 1
CUR.2	Output current 2
OUT	Output signal
4 - 20	4 to 20mA
0 - 20	0 to 20 mA
R.0	Value at 0 mA
R. 4	Value at 4 mA
R. 20	Value at 20 mA
CU22	Out of range output current 22 mA
WASH	Wash
H. INT	Cleaning interval in hours
S. DUR	Cleaning duration in seconds
CONF	Configuration
BKLT	Back light
LEVL	Level
PH SY	Symmetrical pH mode
PH ASY	Asymmetrical pH mode
ORP SY	Symmetrical ORP mode
ORP ASY	Asymmetrical ORP mode
AL. D	Alarm delay
AL.C	Alarm Contact
STDY	Steady
FLET	Fleet, impulse
GLAS EL	Glass electrode
ANTY EL	Antimony electrode
DEF	Default
FCT DEF	Factory default
CAL DEF	Calibration default

For more information on our products, contact your nearest distributor or visit our website listed below:

Thermo Scientific Water Analysis Environmental Instruments Blk 55, Ayer Rajah Crescent, #04-16/24 Singapore 139949 Tel: (65) 6778 6876 Fax: (65) 6773 0836 E-mail: eutech@thermofisher.com Web-site: http://www.thermo.com/process	**Oakton Instruments** P.O Box 5136, Vernon Hills, IL 60061, USA Tel (in U.S.): 888-462-5866 Tel (outside U.S.): 1-847-549-7600 Fax: (1) 847-247-2984 E-mail: info@4oakton.com Web-site: http://www.4oakton.com
Distributed by:	